PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of	Docket No: Q77694
Masayoshi SAWAI	
Appln. No.: 10/669,644	Group Art Unit: 2123
Confirmation No.: 4448	Examiner: Mary JACOB
Filed: September 25, 2003	

For: METHOD OF ASSISTING WIRING DESIGN OF WIRING STRUCTURE, ITS APPARATUS AND ITS PROGRAM

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

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I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Yazaki Corporation. The assignment was previously submitted and was recorded by the Assignment Branch of the U.S. Patent and Trademark Office, April 5, 2004 at Reel 015181, Frame 0019.

II. RELATED APPEALS AND INTERFERENCES

Upon information and belief, there are no other prior or pending appeals, interferences, or judicial proceedings known to Appellants, Appellants' representative or the Assignee that may be related to, be directly by, or have a bearing on the Board 's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-8 are pending in the application. Claims 1-8 are rejected (*see* final Office Action dated January 10, 2007). **Claims 1-8 are on appeal** (*see* attached Claims Appendix).

IV. STATUS OF AMENDMENTS

No amendments were made to the pending claims after issuance of the Final Office Action dated January 10, 2007.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention relates to a method of assisting a wiring design of a wiring structure. According to the present invention, an optimum wiring design for a wire harness can be obtained. In prior art designs, the design and integration of the wiring harness is carried out by trial and error method and as such a high degree of skill is required. Further, resonance can occur in the wiring harness due to vibrations imparted to the harness by the engine or other parts of a vehicle to which the wiring harness is tied. The present invention provides for calculating a natural frequency and a natural vibration mode for a specific wiring harness design so that the parameters input for coming up with the specific wiring harness design can be tweaked in order to avoid resonance. Thereby, an accurate wiring harness design can be obtained that can be integrated with a vehicle, etc.

The present invention as recited in claim 1 is directed to a method of assisting a wiring design of a wiring structure (Summary of the Invention at page 2 lines16-25 and Fig. 8). The method comprises regarding the wiring structure constituted by a plurality of pieces of line streak members as an elastic body having a circular section, the elastic body having a plurality of beam elements coupled with each other, a linearity of the plurality of beam elements being maintained (Fig. 1 and page 12 lines 14-22). The method further comprises applying information concerning a shape characteristic (Fig. 3B, page 13 lines 23-24), a material characteristic (paragraph bridging pages 13 and 14) and a constraining condition of the wiring structure as a predetermined condition to a finite element method (Fig. 2, 8, page 27 lines 8-24). Once the above information is applied, the method continues as calculating a predicted shape of a

displaced wiring structure such that the predetermined condition is satisfied (paragraph bridging pages 28 and 29, and paragraph bridging pages 29 and 30). The method also includes further calculating a characteristic value with respect to vibration for the calculated predicted shape (item S3 Fig. 8, page 30 lines 10-14); and outputting the calculated predicted shape and the calculated characteristic value (item S4 Fig. 8).

The present invention as recited in claim 4 also provides for a method of assisting a wiring design of a wiring structure by calculating a predicted shape concerning a wiring structure constituted by a plurality of pieces of line streak members (Summary of the Invention at page 2 lines 16-25 and Fig. 1, 9B). The method includes analyzing a characteristic value with respect to vibration for the predicted shape (item S3 Fig. 8, page 30 lines 10-14); and outputting a result of the analysis (item S4 Fig. 8).

The present invention as recited in claim 7 also provides for an apparatus (Fig. 7) for assisting a wiring design of a wiring structure in which the wiring structure constituted by a plurality of pieces of line streak members (Fig. 1) is regarded as an elastic body having a circular section, the elastic body having a plurality of beam elements coupled with each other, a linearity of the plurality of beam elements being maintained (Fig. 1 and page 12 lines 14-22), and a shape of the wiring structure which satisfies a predetermined condition is predicted by utilizing a finite element method (item S2 Fig. 8), the apparatus comprising a setting unit for setting information concerning a shape characteristic, a material characteristic and a constraining condition of the wiring structure as the predetermined condition (item S1 Fig. 8). The apparatus further includes a predicted shape calculating unit for calculating a predicted shape of a displaced wiring structure such that the condition is satisfied by applying the predetermined condition to the finite

element method (paragraph bridging pages 28 and 29, and paragraph bridging pages 29 and 30). The apparatus further includes a natural vibration mode calculating unit for calculating a natural vibration mode with respect to the predicted shape calculated by the predicted shape calculating unit (page 30 lines 10-15), and an outputting unit for outputting the calculated predicted shape and the calculated natural vibration mode (item 23 Fig. 7, page 26 lines 13-16).

The present invention as recited in claim 5 also provides for an apparatus (Fig. 7) for assisting a wiring design of a wiring structure in which the wiring structure constituted by a plurality of pieces of line streak members (Fig. 1) is regarded as an elastic body having a circular section, the elastic body having a plurality of beam elements coupled with each other, a linearity of the plurality of beam elements being maintained (Fig. 1 and page 12 lines 14-22), and a shape of the wiring structure which satisfies a predetermined condition is predicted by utilizing a finite element method (item S2 Fig. 8), the apparatus comprising a setting unit for setting information concerning a shape characteristic, a material characteristic and a constraining condition of the wiring structure as the predetermined condition (item S1 Fig. 8). The apparatus further includes a predicted shape calculating unit for calculating a predicted shape of a displaced wiring structure such that the condition is satisfied by applying the predetermined condition to the finite element method (paragraph bridging pages 28 and 29, and paragraph bridging pages 29 and 30). The apparatus also includes a natural frequency calculating unit for calculating a natural frequency with respect to the predicted shape calculated by the predicted shape calculating unit (page 30 lines 10-15), and a first outputting unit for outputting the calculated predicted shape and the calculated natural frequency (item 23 Fig. 7, page 26 lines 13-16).

The present invention as recited in claim 8 also provides for a recording medium (item 29 Fig. 7) storing a program (item 29a Fig. 7) which causes a computer to function as an apparatus of assisting wiring design of a wiring structure. The description for the remaining features of claim 8 is the same as the description for the same features given for claim 5.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Rejection of claims 1-8 under 35 U.S.C. § 103(a) as being unpatentable over Kodama et al. (US 6,961,683) hereinafter "Kodama" in view of Neul et al. ("A Modeling Approach to include Mechanical Microsystem Components into the System Simultation", Proceedings of Design, Automation and Test in Europe, pages 510-517, 23-26 February, 1998) hereinafter "Neul" and Peterson et al. ("Application of Dynamic System Identification to Timber Beams", Journal of Structural Engineering, April 2001, pages 418-425) hereinafter "Peterson".

VII. ARGUMENT

Claims 1-8 are not rendered unpatentable under 35 U.S.C. § 103(a) by the combination of Kodama, Neul and Peterson.

Independent Claim 1

The method for assisting a wiring design recited in claim 1 requires, *inter alia*, that certain assumptions be made prior to modeling the wiring structure and making further computations, one of the assumptions being that the linearity between the plurality of beams elements is maintained. Appellants submit that the above assumptions required by claim 1 are not suggested by the combination of Kodama, Neul and Peterson. The patent office admits that Kodama fails to teach this feature of claim 1 and asserts that Neul cures this deficiency of Kodama.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicant's disclosure. MPEP 2143 *citing In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Kodama is generally directed to calculating the wiring shape of a wire harness, which satisfies the coordinates of fixing points of connectors. See Fig. 1. Then, a flexural rigidity of

the wire harness is calculated. Based on the flexural rigidity, forces F and moments M produced in portions of the wire harness are calculated and subsequently the shape of the wire harness is determined. Kodama states that it is able to implement a more practical simulation of the wiring harness by giving weight to not only geometric factors, but also dynamic factors. An expression for determining the flexural rigidity in Kodama is given on col. 8, line 27.

The patent office contends that Neul teaches the use of a finite element method and linear systems. The patent office further contends that the combined teachings of Neul and Kodama suggest the assumption that linearity between the plurality of beams elements is maintained. Neul merely states that linear systems are being used in Neul's modeling approach in the paragraph bridging pages 514 and 515. The cited portion simply states in part, "Because we are dealing with linear systems, displacements of single elements are added and thus there is no difference between models with a different number of elements". Linearity in terms of claim 1 is a mathematical concept of there is no reason or rationale for including a requirement of linearity in the calculations of Kodama for determining flexural rigidity and the shape of a wire harness.

Further, Appellants also submit that the combination of Kodama, Neul, and Peterson does not teach or even suggest that all the three predetermined conditions of a shape characteristic, a material characteristic, and a constraining condition must be satisfied by the calculated predicted shape of the wiring structure, as required by claim 1. The patent office asserts that Kodama teaches this feature of claim 1. See Final Office Action page 4. However, Kodama only suggests that a wiring shape is calculated such that a condition for the fixing positions is satisfied. See col. 16, lines 33-39.

Appellants also submit that a feature of "calculating a characteristic value with respect to vibration for the calculated predicted shape" recited in claim 1 is not taught by the combination of Kodama, Neul and Peterson. The patent office admits that Kodama fails to teach or even suggest this feature of claim 1. The patent office relies on Peterson and Neul to cure this deficiency of claim 1. Specifically, the patent office contends that Peterson suggests the above feature of claim 1 on page 422, col. 2, lines 3-17. See Office Action page 6. The patent office also contends that Neul suggests this limitation of claim 1.

Neul suggests analytically calculating the natural frequencies of a beam to verify the dynamic properties of the models generated with the modeling approach taught in Neul. See first full paragraph on page 515. However, the model generated with the modeling approach in Neul is not a calculated shape of the beam or a calculated shape of a wiring harness. In fact, the model for which the natural frequencies are calculated is a simple beam structure that has been chosen arbitrarily. See Section 5, Model Validation.

Turning to Peterson, which generally suggests modal analysis to determine natural frequencies of vibration, mode shapes, and damping ratios from experimental vibration measurements. Based on the above modal analysis, damage within a structure can be determined. See Introduction. Further, Peterson suggests performing a frequency analysis to obtain the natural frequencies of vibration for the first two modes of vibration. See first full paragraph on page 422. However, Peterson does not suggest obtaining the natural frequencies for a calculated shape of a wiring harness. Therefore, a feature of claim 1 is not suggested by the prior art of record.

Even assuming arguendo that the prior art teaches calculating a characteristic value with respect to vibration for the calculated predicted shape, Appellants respectfully submit that there is no reason or rationale to modify Kadoka to include a feature of calculating a characteristic value with respect to vibration for Kodama's calculated shape and any such contention will be the result of impermissible hindsight. [A] factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of argument reliant upon ex post reasoning." KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727, 82 USPQ2d at 1397.

Appellants respectfully submit that the patent office has not satisfied the burden of establishing *prima facie* obviousness at least because the analysis presented in the previous Office Action has not satisfied the "all limitations" prong of the three prong test for obviousness. Specifically, the patent office has not shown that the combined teachings of Kodama, Neul and Peterson suggest the invention as a whole including at least the limitations that are discussed above. For at least the reasons discussed above, Appellants respectfully request the Board to reverse the rejection of claim 1.

Independent Claim 4

Claim 4 recites a feature of analyzing a characteristic value with respect to vibration for the predicted shape. Appellants respectfully submit that the combination of Kodama, Neul and Peterson do not render claim 4 obvious at least for reasons discussed above with respect to this feature.

Independent Claims 5, 7, and 8

These claims are patentable at least for reasons discussed above with respect to claim 1.

All the dependent claims are patentable by virtue of their dependency.

Conclusion

Unless a check is submitted herewith for the fee required under 37 C.F.R. §41.37(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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65565
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Date: October 11, 2007

CLAIMS APPENDIX

CLAIMS 1 - 8 ON APPEAL:

1. (previously presented): A method of assisting a wiring design of a wiring structure comprising the steps of:

regarding the wiring structure constituted by a plurality of pieces of line streak members as an elastic body having a circular section, the elastic body having a plurality of beam elements coupled with each other, a linearity of the plurality of beam elements being maintained;

applying information concerning a shape characteristic, a material characteristic and a constraining condition of the wiring structure as a predetermined condition to a finite element method;

calculating a predicted shape of a displaced wiring structure such that the predetermined condition is satisfied;

further calculating a characteristic value with respect to vibration for the calculated predicted shape; and

outputting the calculated predicted shape and the calculated characteristic value.

2. (original): The method according to claim 1, wherein the characteristic value includes at least one of a natural frequency and a natural vibration mode.

3. (original): The method according to claim 1, wherein

the wiring structure is a wire harness wired to a vehicle,

the constraining condition is defined by coordinates of respective apexes of the plurality of beam elements and degrees of freedom at the respective apexes,

the shape characteristic is defined by a sectional area and a length of the beam element of the wiring structure, and

the material characteristic is defined by a moment of inertia, a polar moment of inertia, a density and a longitudinal modulus of elasticity and a transverse modulus of elasticity of the beam element.

4. (original): A method of assisting a wiring design of a wiring structure by calculating a predicted shape concerning a wiring structure constituted by a plurality of pieces of line streak members, the method comprising the steps of:

analyzing a characteristic value with respect to vibration for the predicted shape; and

outputting a result of the analysis.

5. (previously presented): An apparatus of assisting a wiring design of a wiring structure in which the wiring structure constituted by a plurality of pieces of line streak members is regarded as an elastic body having a circular section, the elastic body having a plurality of beam elements coupled with each other, a linearity of the plurality of beams being maintained , and a shape of the wiring structure which satisfies a predetermined condition is predicted by utilizing a finite element method, the apparatus comprising:

a setting unit for setting information concerning a shape characteristic, a material characteristic and a constraining condition of the wiring structure as the predetermined condition;

a predicted shape calculating unit for calculating a predicted shape of a displaced wiring structure such that the condition is satisfied by applying the predetermined condition to the finite element method;

a natural frequency calculating unit for calculating a natural frequency with respect to the predicted shape calculated by the predicted shape calculating unit; and

a first outputting unit for outputting the calculated predicted shape and the calculated natural frequency.

6. (original): The apparatus according to claim 5 further comprising:

a natural vibration mode calculating unit for calculating a natural vibration mode with respect to the predicted shape calculated by the predicted shape calculating unit; and

a second outputting unit for outputting the calculated predicted shape and the calculated natural vibration mode.

7. (previously presented): An apparatus of assisting a wiring design of a wiring structure in which the wiring structure constituted by a plurality of pieces of line streak members is regarded as an elastic body having a circular section, the elastic body having a plurality of beam elements coupled with each other, a linearity of the plurality of beam elements being maintained, and a shape of the wiring structure which satisfies a predetermined condition is predicted by utilizing a finite element method, the apparatus comprising:

a setting unit for setting information concerning a shape characteristic, a material characteristic and a constraining condition of the wiring structure as the predetermined condition;

a predicted shape calculating unit for calculating a predicted shape of a displaced wiring structure such that the condition is satisfied by applying the predetermined condition to the finite element method;

a natural vibration mode calculating unit for calculating a natural vibration mode with respect to the predicted shape calculated by the predicted shape calculating unit; and

an outputting unit for outputting the calculated predicted shape and the calculated natural vibration mode.

8. (previously presented) A recording medium storing a program which causes a computer to function as an apparatus of assisting wiring design of a wiring structure in which the wiring structure constituted by a plurality of pieces of line streak members is regarded as an elastic body having a circular section, the elastic body having plurality of beam elements coupled with each other, a linearity of the plurality of beam elements being maintained , and a shape of the wiring structure which satisfies a predetermined condition is predicted by utilizing a finite element method, the program causing the computer to functions as:

a setting unit for setting information concerning a shape characteristic, a material characteristic and a constraining condition of the wiring structure as the predetermined condition;

a predicted shape calculating unit for calculating a predicted shape of a displaced wiring structure such that the condition is satisfied by applying the predetermined condition to the finite element method;

a natural frequency calculating unit for calculating a natural frequency with respect to the predicted shape calculated by the predicted shape calculating unit; and

an outputting unit for outputting the calculated predicted shape and the calculated natural frequency.

EVIDENCE APPENDIX:

None.

RELATED PROCEEDINGS APPENDIX

None.

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SUBMISSION OF APPEAL BRIEF

MAIL STOP APPEAL BRIEF - PATENTS
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Sir:

Submitted herewith please find an Appeal Brief. The USPTO is directed and authorized to charge the statutory fee of $510.00 and all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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